



EINSTEIN'S ETERNAL MYSTERY OF EPISTEMOLOGY EXPLAINED:

The Four-Stage Creative Process in Art, Science, Myth, and Psychotherapy

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Note from the author: This conceptual review celebrates the centennial of the 1905 Annus Mirabilis wherein Einstein submitted five papers to Annalen der Physik (the premier German physics journal) that introduced our current holistic perspective of space-time and theories of everything. Adopting Einstein as my mentor, I illustrate in this article the classical 4-stage creative process as a model of psychotherapy that encompasses the neuroscience of gene expression and brain plasticity as a new holistic perspective of art, culture and philosophy.

Abstract

Einstein's eternal mystery of epistemology, how we can understand the world, is explained as a dynamic cycle of human creativity that engages gene expression, new protein synthesis, and brain plasticity. The classical four-stage creative process in the arts and sciences is adapted as a positive model for highly focused short-term psychotherapy wherein people learn to solve their problems in their own way on all levels, from social relationships to the interaction between mind, brain, and gene expression. Psychotherapists would be wise not to buy into the controversial image of being the know-it-all answer-person portrayed by the popular media. Psychotherapists really only know one thing: how to enjoy empowering others to discover and facilitate their own evolving style of creativity with implicit processing heuristics that turn on gene expression, brain plasticity, and mind-body healing in response to the natural challenges, stresses, and traumas of life that crowd the growing edge of our consciousness.

On March 30, 1952, the mature Albert Einstein (1993) wrote a letter to his friend Maurice Solovine in which he tried to explain the miracle of how it is possible to comprehend the world.

Now I come to the most interesting point in your letter. You find it strange that I consider the comprehensibility of the world (to the extent authorized to speak of such a comprehensibility) as a miracle or as an eternal mystery. Well, a priori one should expect a chaotic world which cannot be grasped by the mind in any way. One could (yes one should) expect the world to be subjected to law only to the extent that we order it through our intelligence. Ordering of this kind would be like the alphabetical ordering of the words of a language. By contrast, the kind of order created by Newton's theory of gravitation, for instance is wholly different. Even if the axioms of the theory are proposed by man, the success of such a project presupposes a high degree of ordering of the objective world, and this could not be expected a priori. That is the 'miracle' which is being constantly reinforced as our knowledge expands.

There lies the weakness of positivists and professional atheists who are elated because they feel that they have not only rid the world of gods but 'bared the miracles.' Oddly enough, we must be satisfied to acknowledge the 'miracle' without there being any legitimate way for us to approach it. I am forced to add that just to keep you from thinking that—weakened by age—I have fallen prey to the parsons." (p. 133)

I recently explored the implications of current neuroscience research on the molecular-genomics of memory, learning, positive motivation, and meaning in

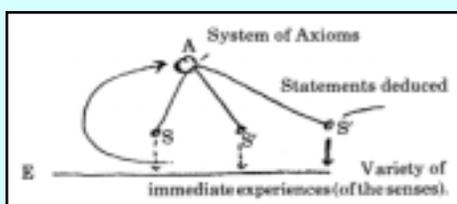


Figure 1: Einstein's sketch of the mystery of epistemology.

comprehending the world. I introduced the idea of how art, truth, beauty, and spirit are all connected via a special state of psychobiological arousal that turns on gene expression, protein synthesis, and brain plasticity (growth) in the daily construction and reconstruction of meaning and consciousness (Rossi, 2002, 2004a). I now extend this view to explain what Einstein called the "miracle" and "eternal mystery" of how is it possible to comprehend the world in a scientific manner. The connecting link is suggested by another letter written about a month later, on May 7, 1952, wherein Einstein tried to explain to Solovine the central unresolved mystery of epistemology with a hand-sketched diagram illustrated in Figure 1.

As for the epistemological question, you completely misunderstood me; I probably expressed myself badly. I see the matter schematically in this way:

(1) The Es (immediate experiences) are our data.

(2) The axioms from which we draw our conclusions are indicated by A. Psychologically the As depend on the Es. But there is no logical route leading from the Es to the As, but only an intuitive connection (psychological), which is always 're-turning'

(3) Logically, specific statements S, S', S'' are deduced from A; these statements can lay claim to exactness.

(4) The As are connected to the Es (verification through experience). Closer examination shows that this procedure also belongs to the extralogical (intuitive sphere), for the relation between the notions show up in S and the immediate experiences are not logical in nature.

But the relation between Ss and Es is (pragmatically) much less certain than the relation between the As and the Es. (Take the notion 'dog' and the corresponding immediate experiences.) If such a relationship could not be set up with a high degree of certainty (though it may be beyond the reach of logic), logical machinery would have no value in the 'comprehension of reality'

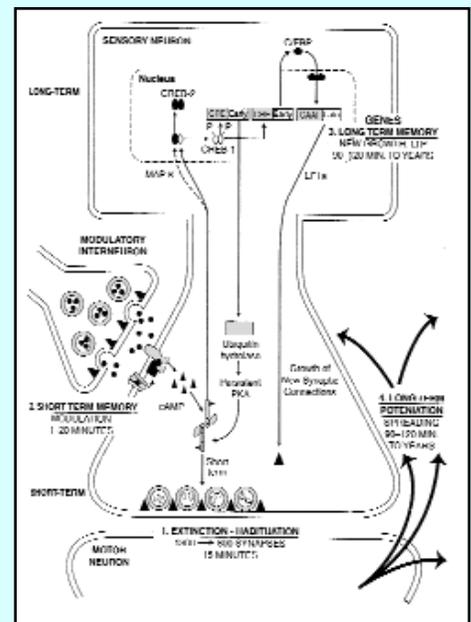


Figure 2: A neuroscience update of Einstein's eternal mystery and the genomic core of psychotherapy. Adapted and modified from Kandel et al., 2000.

(example: theology).

What this all boils down to is the eternally problematical connection between the world of ideas and that which can be experienced (immediate experiences of the senses). (Einstein, 1993, p. 138-139)

Einstein's eternally problematical connection of how we can comprehend the world is illustrated in his sketch (Figure 1) by the returning arrow on the left side pointing upward from the statements deduced (S, S', S'') and E (immediate experiences) to A (system of axioms). Einstein correctly noted that psychologically the As (axioms) depend on the Es (experiences), but at the present time there is no logical or scientific explanation for the returning arrow he draws from the Ss and Es back to the As. This is where the traditional philosophy of science, epistemology, and logic fails. As Einstein writes, there is an "intuitive connection (psychological), which is always returning" or replaying between the sensory experience of the brain and mind, but the mystery is that there is apparently no logic to it or satisfactory scientific explanation of it.

Einstein's use of terms like "miracle," "mystery," and "intuition" for this returning connection between the world of sensory experience and the logic of the mind

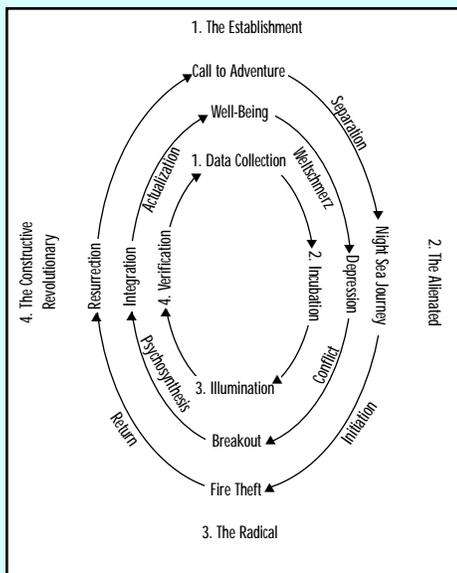


Figure 3: Breakout heuristic as a model of short term psychotherapy. Inner circle illustrates the classical 4-stage creative cycle; middle circle applies 4-stage creative cycle to psychotherapy; outer circle applies 4-stage creative process to Campbell's mono-myth of humankind; outer labels note the 4 socio-political groups.

remind us of the theologian Rudolph Otto, who formulated the concept of the “numinous” (the sense of fascination, mystery, and tremendous importance) to describe the essence of original, creative spiritual experience. I have noted how such numinous states of creative, artistic, and spiritual excitement are essentially similar to the psychobiological arousal evoked by novelty, environmental enrichment, and physical exercise, which current neuroscience associates with gene expression, protein synthesis, and brain plasticity in the normal process of the reconstructing consciousness, memory, and learning in daily life (Rossi, 2002, 2004a, 2004b).

In this new context that I call psychosocial genomics, Einstein's eternal mystery and the miracle of the returning arrow can be explained as an intuitive illustration of the replay of novel, surprising, and numinous experiences during offline states (such as sleep, dreaming, quiet wakefulness, meditative moments, and periods of private inner work and creative replay in psychotherapy) when gene expression, new protein synthesis, and brain plasticity are busy reconstructing and updating the neural networks of the brain and mind (Rossi, 2002, 2004a, 2004b, in press). This new view can be illustrated by replacing Einstein's return-

ing arrow of mysterious intuition with a schematic image of how sensory neurons in the brain, when stimulated by novel and salient signals from the environment, actually turn on gene expression, new protein synthesis, and brain growth (usually called “brain plasticity” by neuroscientists) (See Figure 2).

Creative Replay as an Essential Dynamic in Psychotherapy

A central issue of current neuroscience is to determine how new experiences are converted into stable, long-term memory, while still being available for change and updating with later experience. According to well replicated research, after a highly motivating, salient, new, surprising, unusual, traumatic, stressful, or unexpected life experience, many brain circuits replay the memorable event on the molecular-genomic level during the offline periods of rest, recovery, quiet time, sleep, and dreaming.

One of the most interesting lines of research on the natural dynamics of creative replay during sleep and dreaming may have important implications for psychotherapy. It has been found that when experimental animals experience novelty, environmental enrichment, and physical exercise, the zif-268 gene is expressed during their rapid eye-movement (REM) sleep. Ribeiro et al. (2004) recently summarized the complementary role of neural replay during the sleep stage of REM dreaming versus deep slow-wave (SW) sleep in the consolidation of new memories as follows:

The discovery of experience-dependent brain reactivation during both slow-wave (SW) and rapid eye-movement (REM) sleep led to the notion that the consolidation of recently acquired memory traces requires neural replay during sleep ... Based on our current and previous results, we propose that the two major periods of sleep play distinct and complementary roles in memory consolidation: pretranscriptional recall during SW sleep and transcriptional storage during REM sleep... In conclusion, sustained neuronal reverberation during SW sleep,



Figure 4: Stage one of the creative cycle in psychotherapy—implicit processing heuristics facilitating immediate early genes in preparation for problem solving.

immediately followed by plasticity-related gene expression during REM sleep, may be sufficient to explain the beneficial role of sleep on the consolidation of new memories. (p. 126–135).

I have recently reviewed the extensive neuroscience literature on how the reactivation of fear, stress, and traumatically encoded memories in psychotherapy can be the first step in creatively replaying and reconstructing fears, stress, and traumatic memories at the levels of gene expression, brain plasticity, and behavior (Rossi, 2002, 2004a, 2004b, in press). Creative replay in psychotherapy is very different from the repetitive or rote replay of obsessive-compulsive, symptomatic, and neurotic behavior. Such behavior is maladaptive precisely because people can get stuck in stage two of the four-stage creative process, as illustrated in the next section.

From the neuroscience perspective, the simple process of recalling and creatively replaying fear, stress, and traumatic memories within a new positive therapeutic framework can initiate the molecular-genomic dynamics of psychotherapy. This may correspond, at least in part, to the popular psychotherapeutic metaphor, “Every replay is a reframe.” This suggests that many schools of psychotherapy have developed their own style of creatively replaying memory as a central technique for facilitating change. For example, ask-



Figure 5: Stage two of the creative cycle in psychotherapy—incubations, creative replay, and psychobiological arousal evoke behavior state-related gene expression.

ing a person to describe his or her problem in an initial interview is essentially asking for a recall or replay of his or her memory. This memory replay often brings spontaneous tears, which indicate the person is already engaged in the initial stages of emotional catharsis as a prelude to constructing a new context for understanding the meaning of his or her problem and how to resolve it. Therapeutic hypnosis to access troublesome memories, Freudian free-association, Jungian active imagination, Gestalt dialogue, the lists and hierarchies of cognitive-behavioral therapy, and Carl Roger's non-directive therapy are all different techniques that have the common goal of evoking the psychotherapeutic replay of memory, meaning, and behavior. The implication of current neuroscience research is that this recall and creative replay activate gene expression, protein synthesis, and the reconstruction of the neural networks of the brain (usually called brain plasticity). This suggests that the efficacy of psychotherapy on the molecular-genomic level can be sharpened and focused by expanding upon the major neuroscience research techniques for turning on gene expression and brain plasticity—experiences of novelty, enrichment, and exercise (Rossi, 2002, 2004b). The heightened states of positive motivation that are joy-



Figure 6: Stage three of the creative cycle in psychotherapy—illumination via activity-dependent gene expression and brain plasticity.

fully experienced in the creative arts, humanities, and sports (exercise), for example, are not superficial frills of life. They are psychosocial and cultural approaches to well being that facilitate creative replay on molecular genomic-levels to update and reconstruct the neural networks of the brain that are experienced as insight and new meaning.

Einstein's eternal mystery and the miracle of the returning arrow in Figure 1 could be explained empirically by this illustration of how brain neurons receive novel and numinous immediate experiences (of the senses) and convert them into molecular signals to transcribe (turn on) a series of genes (CRE early, CAAT late) that generate the proteins used for the growth of new synaptic connections in brain plasticity, which reconstructs memory, learning, and consciousness. This is the molecular-genomic core of creative replay in psychotherapy that we hope to access and turn on with implicit processing heuristics. Note that this dynamic molecular-genomic process of long-term memory requires about 90 to 120 minutes, which places it in the general time frame of a single session of psychotherapy. From this perspective, the traditional 50-minute psychotherapy session, as well as the 1-, 5-, 10-, or 20-minute consultation, can be practical and effective in proportion to the motivational efficacy of the

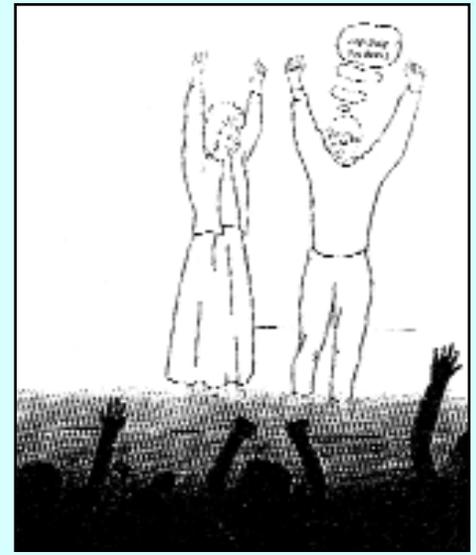


Figure 7: Stage four of the creative cycle in psychotherapy—verification, social support, and the possibility of zif-268 gene expression facilitating brain plasticity.

novel and enriching information that has been exchanged. Ordinary short-term memory (1 to 20 minutes), by contrast, depends only on the millisecond dynamics of neurotransmitters flowing between one neuron and the next that do not require gene expression (adapted and modified from Kandel, Schwartz, & Jessell, 2000; Rossi, 2002, 2004b).

I propose that this empirical (rather than philosophical) explanation of Einstein's eternal mystery also explains what has been called the unreasonable effectiveness of mathematics in the natural sciences (Wigner, 1960). The following quote from the bellwether essay by Wigner helps make the transition between these classical philosophical issues to my current practical approaches to facilitating the four-stage creative process in short-term psychotherapy.

The first point is that the enormous usefulness of mathematics in the natural sciences is something bordering on the mysterious and there is no rational explanation for it. Second, it is just this uncanny usefulness of mathematical concepts that raises the question[s] ... 'What is mathematics?' Then, 'What is physics?' Then, how mathematics enters physical theories, and last, why the success of mathematics in its role in physics appears so baffling?" (p. 3) After discussing these questions and

Table I. *The 90- to 120-minute ultradian basic rest-activity cycle as the psychobiological basis of the four-stage creative process in everyday life.*

The Ultradian Healing Response

- 1. Recognition Signals:** An acceptance of nature's call for your need to rest and recover your strength and well-being leads you into an experience of comfort and thankfulness.
- 2. Accessing the Deeper Breath:** A spontaneous deeper breath comes all by itself after a few moments of rest as a signal that you are slipping into a deeper state of relaxation and healing. Explore the deepening feeling of comfort that comes spontaneously. Wonder about the possibilities of mind-gene communications and healing with an attitude of "dispassionate compassion."
- 3. Mind-Body Healing:** Spontaneous fantasy, memory, feeling-toned complexes, active imagination, and numinous states of being are orchestrated for healing and life reframing.
- 4. Rejuvenation and Awakening:** A natural awakening with feelings of serenity, clarity, and healing together with a sense of how you will enhance your performance and well-being in the world.

The Ultradian Stress Syndrome

- 1. Take-a-Break Signals:** A rejection of nature's call for your need to rest and recover your strength and well-being leads you into an experience of stress and fatigue.
- 2. High on Your Hormones:** Continuing effort in the face of fatigue leads to the release of stress hormones that short circuit the need for ultradian rest. Performance goes up briefly at the expense of hidden wear and tear so that you fall into further stress and a need for artificial stimulants (caffeine, nicotine, alcohol, cocaine, etc.).
- 3. Malfunction Junction:** Many mistakes creep into your performance, memory, and learning; emotional problems become manifest. You may become depressed or irritable and abusive to yourself and others.
- 4. The Rebellious Body:** Classical psychosomatic symptoms now intrude so that you finally have to stop and rest. You are left with a nagging sense of failure, depression, and illness.

finding no satisfactory answer on a philosophical or empirical level, Wigner (1960) noted the need to look for a solution by integrating our understanding of consciousness, the biology of heredity, and physics as follows:

A much more difficult and confusing situation would arise if we could, some day, establish a theory of the phenomena of consciousness, or of biology, which would be as coherent and convincing as our present theories of the inanimate world. Mendel's laws of inheritance and the subsequent work on genes may well form the beginning of such a theory as far as biology is concerned... The reason that such a situation is conceivable is that, fundamentally, we do not know why our theories work so well... The miracle of the appropriateness of the language of mathematics for the formulation of the laws of physics is a wonderful gift which we neither understand nor deserve. We should be grateful for it and hope that it will remain valid in future research and that it will extend, for better or for worse, to our pleasure, even though perhaps to our bafflement, to wide branches of learning." (p. 9)

For Einstein, who was writing in 1952, this fundamental problem of epistemolo-

gy was an eternal mystery. For Wigner, only 8 years later in 1960, it was still bafflement, but at least there was a hint for a solution.

If we could, some day, establish a theory of the phenomena of consciousness, or of biology, which would be as coherent and convincing as our present theories of the inanimate world. Mendel's laws of inheritance and the subsequent work on genes may well form the beginning of such a theory as far as biology is concerned." (Wigner, 1960, p. 9)

What happened historically between Einstein's letters of 1952 and Wigner's essay of 1960 to change an eternal mystery into mere human bafflement that could be resolved with a new theory of consciousness, biology, and genes? Watson and Crick (1953a, 1953b) published their two famous papers solving the DNA molecular code of life and providing some indication of this new understanding of genes, for which they received the Nobel Prize. Today, with the benefit of two generations of genomics and neuroscience research about this highly significant discovery, experts can hope to better understand how to generalize Wigner's wonderful gift in the wide branch of learning called psychotherapy.

The Four-Stage Creative Process in Psychotherapy

The origin of the classical four-stage process of creativity—data collection, incubation, illumination, and verification—interestingly enough, is usually attributed to the French mathematician Henri Poincaré (Hadamard, 1954). I originally used this four-stage creative process as the core breakout heuristic of psychotherapy, as well as mythology and the socio-political process (Rossi, 1968) (See Figure 3).

Table 1 outlines the four stages of the creative process as they are typically experienced for good or for ill every 1.5 or 2 hours—an ultradian rhythm—in contrast to the 24-hour circadian rhythm in everyday life (Rossi & Nimmons, 1991). Throughout the day, particularly during the low phase of the creative cycle that Poincaré called the rest phase, everyone has a choice as to how to proceed with the natural ultradian rhythm of consciousness, creativity, performance, and healing. For optimal health and performance, individuals need to heed nature's call to take a healing break to experience what I call the ultradian healing response. I now believe that this so-called offline state (the recent technical term introduced by neuroscientists) is identical to what Milton

H. Erickson informally called the common everyday trance and what Kleitman called the rest phase of the 90- to 120-minute basic rest-activity cycle (BRAC). This normal 20-minute rest period at the low phase of the BRAC is often the best time to experience a nap or practice naturalistic forms of self-hypnosis, meditation, prayer, deep self-reflection, and holistic healing (Rossi & Nimmons, 1991). If individuals persistently choose to ignore nature's call for rest and restoration at such times, they will fall into the ultradian stress syndrome where they are prone to experience the genesis of psychosomatic symptoms and the typical dynamics of Freud's psychopathology of everyday life.

The four stages of the creative process as they are typically experienced for good (ultradian healing response) or for ill (ultradian stress response) occur every 1.5 or 2 hours throughout the day (Rossi & Nimmons, 1991, p. 58).

A Videotaped Demonstration of the Four-Stage Creative Process in Single Session Psychotherapy

The four stages are illustrated in a videotaped demonstration of therapeutic hypnosis with a young woman volunteer with severe rheumatoid arthritis in her hands working with a male therapist. This hour-long videotape titled *A Sensitive Fail-Safe Approach to Hypnosis* (IC-92-D-V9) is available from the Ericksonian Foundation (www.erickson-foundation.org) for study by professionals and students. In this article I will describe the actions taking place in the video. Chapters 7 and 8 of my book *The Psychobiology of Gene Expression: Neuroscience and Neurogenesis in Therapeutic Hypnosis and the Healing Arts* (2002) present a detailed verbatim analysis of the entire videotape from an Ericksonian perspective, together with my speculations about how activity-dependent and behavioral-state-related gene expression and brain plasticity may be engaged by the deep psychosocial genomics of the four stages of the creative process in psychotherapy. Current DNA microarray technology is making it possi-

ble to assess gene expression profiles in human blood in real time that could be used to identify changing psychobiological states. I expect that in the near future it will be possible to explore such gene expression profiles with computer software such as GeneSpring (www.silicon-genetics.com) to identify the deep psychobiological dynamics of psychotherapy in real time to empirically validate what can only be speculated about at this time.

Stage One of the Creative Cycle in Psychotherapy: Implicit Processing Heuristics Facilitating Immediate Early Genes in Preparation for Problem Solving

The typical psychotherapeutic session ideally begins with patient and therapist cooperating in a search for the problems and issues that the patient hopes to resolve. The therapist's role in this initial stage is to facilitate this search with familiar yet mildly provocative open-ended questions such as: What is on your mind today? What is most alive in you, right now? Well, what is your truth and beauty these days? I now call these evocative openings implicit processing heuristics, in keeping with the current neuroscience use of the word "implicit" to describe the unconscious dynamics of memory and motivation. They often serve as mini rites of transition between the everyday world of congenial talk and the more focused creative work of the therapy session (detailed in chapter 9 of Rossi, 2002).

From our current neuroscience perspective, these open-ended implicit processing heuristics tend to evoke and replay the individual's personal history and the dissociated (state-dependent) sources and encoding of his or her problems. When emotional problems and highly numinous personal issues are discussed, they will naturally evoke immediate early genes, behavioral state-related genes, and activity-dependent gene expression, which generates the possibility of Darwinian natural variation and selection in new cascades of protein synthesis, brain plasticity, problem-solving, and mind-body healing. This is the

molecular-genomic core of psychotherapy that is our empirical solution to Einstein's eternal mystery of epistemology.

The therapist models a delicately balanced and symmetrical hand position a few inches above his lap to initiate Erickson's hand levitation approach to therapeutic hypnosis and psychotherapy. The patient mirrors this hand position with her hands over her lap (See Figure 4). The therapist initially wonders what stage of Kleitman's Basic Rest-Activity Cycle (BRAC) the patient may be experiencing. He wonders whether CYP17—the social gene—is becoming engaged as a natural manifestation of the psychotherapeutic transference, and to what extent immediate-early genes (IEGs), such as c-fos and c-jun, (associated with a creative state of psychobiological arousal, problem solving, and healing, particularly of the psychoneuro-immune system) are becoming engaged.

Stage Two of the Creative Cycle in Psychotherapy: Incubation, Creative Replay, and Psychobiological Arousal Evoking Behavior State-Related Gene Expression

The patient now experiences psychobiological arousal (associated with behavioral state-related gene expression (BSGE)) as evidenced by the very slight, rapid, involuntary shaking and twitching of her hands and fingers. She is surprised, embarrassed, and confused about these unusual sensations and involuntary movements that were not suggested by the therapist (See Figure 5). This surprising, novel, and numinous experience is evoking a heightened behavioral state-related gene expression that the therapist would like to use for therapeutic purposes. The therapist wonders, for example, how to facilitate the psychosocial genomics of immunological variables such as the interleukins associated with Cox2, which have been implicated in rheumatoid arthritis, which is her presenting symptom. Unfortunately all psychotherapists are working blind at this time because a relatively simple (but expensive) DNA microarray assessment of a blood sample that could provide a

gene expression profile of the patient's deep psychobiological state in real time is not yet available. Nonetheless, the therapist continues to support her with non-directive implicit processing heuristics like, "Do you have the courage to allow that to continue for another moment or two until...?" Until what? Well, hopefully until she stumbles by random Darwinian chance into association patterns about the source of her problems, which may set the stage for their creative resolution in stage three.

Stage Three of the Creative Cycle in Psychotherapy: Illumination Via Activity-Dependent Gene Expression and Brain Plasticity

The client now experiences the playful activity-dependent exercise of shadow boxing as a creative breakout of her typically restrained hand and finger movements associated with angry feelings about her boss, her boyfriend, and her rheumatoid arthritis (See Figure 6). Future research will be needed to determine if activity-dependent gene expression (ADGE)—such as the CREB-related genes and proteins associated with new memory and learning—as well as the ODC and BDNF genes associated with physical growth and brain plasticity—are actually being engaged during the replay of such creative moments in psychotherapy.

Stage Four of the Creative Cycle in Psychotherapy: Verification, Social Support, and the Possibility of Zif-268 Gene Expression Facilitating Brain Plasticity

After flexing her hands and fingers with a mixture of pain and relief, the patient receives positive feedback (See Figure 7). The therapist speculates silently to himself that the zif-268 gene will be expressed in her REM dream states tonight to encode her new, novel, and enriching therapeutic experiences with this unusually enriching, perhaps once-in-a-lifetime, show of psychosocial support. According to recent research, the zif-268 gene codes for a protein important for brain plasticity during

changes in memory and learning while awake (Lee et al., 2004), as well as during creative replays of salient daytime experiences during REM dreams while asleep at night (Ribeiro et al., 2004).

Putting It All Together: Who Will Research the Mind-Body Gap at the Genomic Level of Psychotherapy?

This article proposes a new world view of how the psychological levels of consciousness and novel human experience can modulate gene expression and brain plasticity in sickness and health. The psychosocial genomics of gene expression in neurons of the brain is used as a new model of how current neuroscience could resolve Einstein's eternal mystery of epistemology. Psychosocial genomics explores how the Cartesian mind-body gap can be bridged with implicit processing heuristics to creatively replay gene expression and brain plasticity with the novel, numinous, and enriching experiences of psychotherapy, myths, and dreams, as well as the humanistic arts and spiritual traditions of all human cultures. Much of this new view is still highly controversial and will require the psychotherapeutic community to adopt the techniques of modern neuroscience, functional genomics, and DNA microarray technology to update and further develop the art and science of psychotherapy.

This deep psychobiological perspective of creative psychotherapy is consistent with much of classical psychoanalysis as well as the cognitive-behavioral approaches that are now attempting to integrate the modern neuroscience of consciousness, memory, and learning at the cellular-genomic level. This new integration of theory and research leads to a profound vision of how to utilize the creative process in psychotherapy to facilitate the development and efficacy of personal consciousness on all levels, from the philosophical to the biological matrix of being in gene expression and brain plasticity.

At the present time the unfortunate reality is that there is currently no comprehensive program of experimental research investigating creative psychotherapy on

the molecular-genomic level as proposed here. This may be why the National Institute of Mental Health (NIMH) is no longer supporting funding for psychological research on a purely cognitive-behavioral level without regard for the fundamentals of mental illness on a molecular-genomic level (Holden, 2004; Kaiser, 2004). To resolve this unfortunate funding gap between the behavioral and biological, I am currently exploring the development of new psychosocial genomic paradigms of psychotherapy with GeneSpring, a computer program now widely used by many researchers to trace the ontology of gene expression in mood and behavioral disorders. The psychotherapeutic community urgently needs to network with researchers on the molecular-genomic level who are interested in understanding the significance of their work for the profound issues of how the mind can heal the brain and the body and how psychological experiences can facilitate genuine mind-body healing and rehabilitation. Such a visionary ideal may be what is needed to develop new and inspired approaches to creative psychotherapy and a satisfying resolution for Einstein's eternal mystery of epistemology in the new millennium.

Endnote: A Concordance of Terms, Concepts, and Perspectives

Brain plasticity and psychotherapy: Novelty, enriching life experiences, and exercise associated with a positive sense of curiosity and wonder can turn on activity-dependent gene expression to construct and reconstruct the physical brain and the way it works throughout our entire lifetime. This is the psychobiological essence of the relationship between the creative psychological experience, gene expression, and brain plasticity (change, transformation, growth). Brain plasticity is a natural process of updating and recreating ourselves in our essential daily creative work of building a better brain.

Creative replay and resynthesis is the essence of psychotherapy: Replaying the four-stage creative process for the resynthesis of experience is a fundamental dynamic of most schools of psychotherapy. Our emerging models of creativity, optimal performance, stress, and healing engage Darwinian variation and conscious selection on all levels from mind to gene in the natural flow of human experiencing. Immediate early genes and behavioral state-related and activity-dependent gene expression are bridges between body, brain, and mind that can be accessed to facilitate the cre-

ative replays of psychotherapy.

Immediate early gene expression: A special class of genes called immediate early genes can respond to psychosocial cues and significant life events in an adaptive manner within seconds to minutes. Immediate early genes have been described as the newly discovered mediators between nature and nurture. They receive signals from the environment to activate the genes that code for the formation of proteins, which then carry out the adaptive functions of the cell in health and illness. Immediate early genes are transducers (transformers) of information and energy that integrate mind and body. They are key players in neuroscience that research in psychotherapy now needs to investigate.

Behavioral state-related gene expression: Different states of behavior and consciousness—waking, sleeping, dreaming, emotions, motivation, creative states, and stress—are all associated with different patterns of behavioral state-related gene expression. Behavioral state-related gene expression is a fundamental link between psychology and biology. It is of essence in exploring and facilitating the psychobiology of consciousness in psychotherapy. Behavioral state-related gene expression is an inner resource of behavior that can be modulated by psychosocial cues and cultural rituals to facilitate health, performance, and healing.

Activity-dependent gene expression: Learning to do something new initiates cascades of molecular-genetic processes called activity-dependent gene expression. Activity-dependent gene expression generates the proteins and growth factors that signal stem cells residing in the brain to differentiate into newly functioning neurons with new connections between them. Likewise, stem cells that reside in tissues throughout the body receive psychosocial genomic signals from the immune system that enable them to replace injured cells with healthy ones. This is proposed as a basic dynamic of the healing placebo response.

Individual response-ability and ethical self-realization: Although it is generally recognized that humans are all 99.9% alike in genomic legacy, it is still usually not understood that there are at least three million small variations in human genes called single nucleotide polymorphisms that are expressed in each person's individuality. This implies that all individuals have profoundly unique psychosocial genomic resources for the personal perceptions, potentials, and problems that they alone can recognize and realize as their ultimate response-ability. These are the ultimate inner resources that research needs to document for practical application in psychotherapy. Philosophically this means that mature adults are responsible for the facilitation of their unique psychosocial genomic endowment. Parents, teachers, and psychotherapists may help individuals find their paths, but ultimately, individuals must learn to recognize whether they are really okay in their quests for ethical self-realization, the mindful integration of their personal psychosocial genomic potentials with those of society and culture.

Social and cultural response-ability: The ultimate gifts of art, music, dance, and the humanities have evocative effects on gene expression, brain plasticity, and psychological development in the co-evolution of consciousness and culture. Play, imagination, fantasy, and dreams are all natural exploratory efforts in the creative replay and resynthesis of life experiences on all levels. Gaia, gene, individual, and society co-create each other in the self-reflective creative replays of "becoming." The ultimate response-ability of leadership on all levels is to facilitate this natural co-evolution of the goals, philosophies, and ethics of life.

Positive psychology and the new decade of behavior: The current decade of behavior (2000-2010), as announced by the American Psychological Association, is a wonderful complement to the previous decade of the brain (1900-2000) for integrating mind and body with the new spirit of positive psychology. I hypothesize that experiences of creativity, happiness, humor, uplifting surprise, awe, and that special sense of the numinous—fascination, mysteriousness, and the tremendous—are all associated with immediate early, behavioral state-related, and activity-dependent gene expression, brain plasticity, and self-realization. The challenge for psychology is to discover new research methods for the deepening exploration and the practical implementation of these insights for the rediscovery and recreation of human experience.

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About the Author

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Special thanks go to Dr. Kathryn Rossi, a freelance photographer who contributed the photos of Dr. Ernest Rossi appearing on the cover and page 11 of this issue. She is a clinical psychologist with a private practice in Los Osos, California.

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